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The Trade Review.

A JOURNAL OF MANUFACTURES, COMMERCE, INDUSTRY, SCIENCE, ART AND INVENTION.

Vol. XIV.—No 41. CLEVELAND, OCTOBER 8, 1881. No. 714

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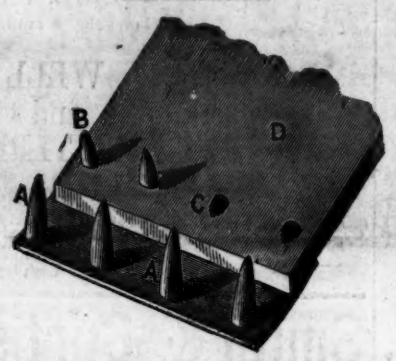

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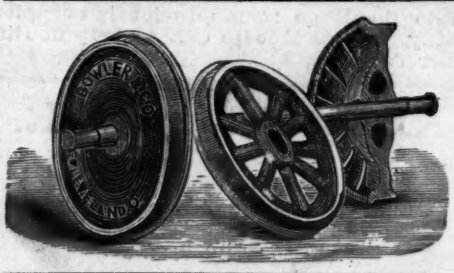

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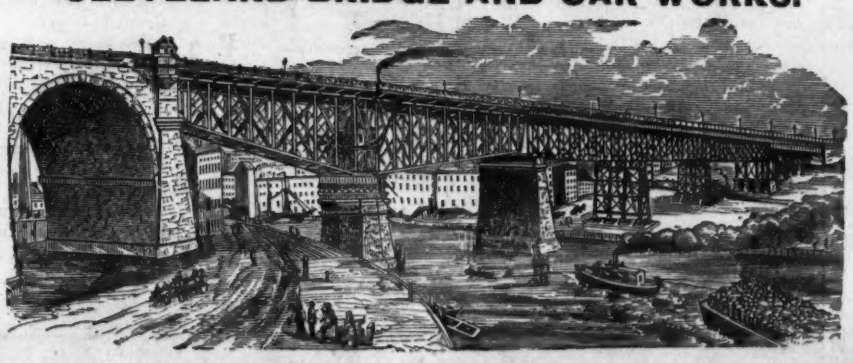

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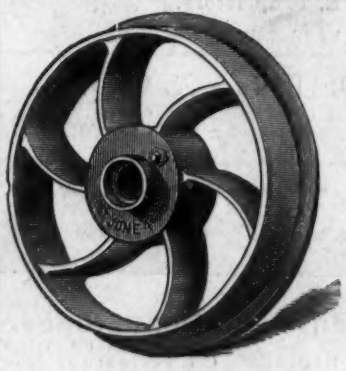

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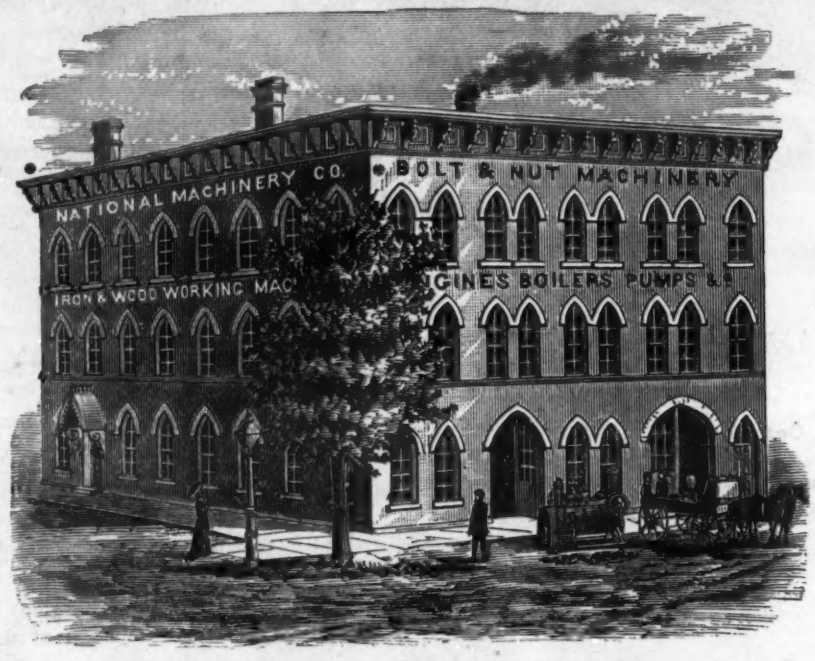

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GENEVA, PA., Jan. 14, 1880

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We have had one of Hogue's Graded Injectors on our boiler since last June, and are pleased to state that it has never failed to perform its duty, separating the water as represented. At first we were skeptical of its doing what we were told it would, but it compels us to say that it surpasses any machine we have ever seen for putting water into a boiler. We wish you success. Our lift is eighteen feet.

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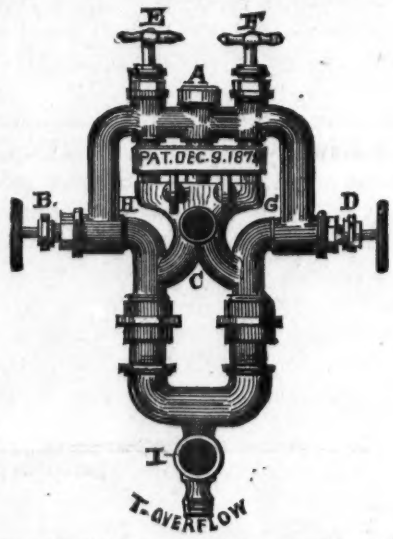

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EXPLANATION.--A--Steam supply pipe B--Steam supply for forcing. C--Exhaust pipe. D--Steam supply for forcing. E and F--Cut-off, water stems. G and H--Cut-off, water cocks. J--Feed pipe leading to boiler. T--Hot overflow. Water supply on other side of cut.

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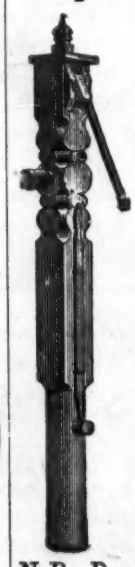

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FOURTEENTH YEAR.

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OHIO INSTITUTE OF MINING ENGINEERS.

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THE CLEVELAND LUMBER YARDS.

In view of the lightness of supply of lumber as compared with last year, the extra demand that has set in and the position of lumber at other leading distributing points, the Cleveland dealers have advanced nearly the entire list. In the appraisement the great run on certain sizes, especially in the building line, has led in several instances to these being advanced in a greater ratio than others in the same scale. It is estimated that we have at least 5,000,000 feet less than at this time last year, and it is probable that by the close of navigation a greater discrepancy will be apparent than at the corresponding period in 1880. It is not that our dealers have failed to bid high for larger quantities; they are simply in the same position as dealers at other points who have been unable to get all they want or all they have contracted for. More lumber was cut in the winter season than ever, but heavy rains and freshets interfered with the early operations of the sawing mills. In addition vessels have been somewhat scarce and freight high. There is yet a large amount of lumber to arrive, and although there is no probability of our dealers being able to meet all requirements, especially as to certain sizes in dry lumber, no question is entertained as to the continuance of an active season. Much has been done in the way of uniformity of sorting, and Cleveland goes far ahead of Chicago and other cities in her system of classification and nomenclature by letters of different sizes and qualities. The Board has appointed a committee of five to investigate the existing system of assorting at the different yards, and report at the next meeting a suitable grading to be adopted by the Board. They will also report in favor of certain names of grades. There is nothing like clearness of designation. Any element of uncertainty interferes with business. The receipts of lumber are now tending to an accumulation of stock. There is no question that the advance which has been established here will be fully maintained.

AMERICAN SHIPPING.

THE French Government bounty system on the building of vessels, as well on their voyages, and which is designed to increase the mercantile marine and commerce of France, has had the effect of inducing a large Glasgow shipbuilding firm to purchase land for the establishment of their business at Havre. The public sentiment of this country is opposed to our Government fostering private enterprise, but the recovery of our share in the ocean commerce of the world is a national matter affecting a thousand interests, and as it is demonstrable that under our navigation laws our shipbuilders, shipowners and charterers of vessels are at a complete disadvantage as compared with other nations, the giving of bounties from the national treasury, and amending in several respects the present statutes, becomes an absolute necessity. With a properly regulated bounty system millions of dollars now going yearly to owners of foreign vessels, for the conveyance of our exports and imports, would be retained by us. As consular reports show, nothing would so strongly contribute to the building up of our trade not only at the ports of the continent of Europe, but in Eastern Asia, as trading in our own vessels. As it is the goods sent to distant countries pass through too many intermediaries to afford to our manufacturers and merchants profits which would encourage more extensive dealings. In leading markets of the world we are at present heavily handicapped by foreigners, not because we have not better goods, but because they secure by maritime facilities more direct transactions. We should be our own importers as well as exporters. Looking to the enormous amount of our foreign trade, it is not to be tolerated that as a nation we shall longer occupy a position of dependency in this matter.

EDUCATION OF MECHANICS.

The education of mechanics is the prime need of the hour. What is Cleveland doing towards it? Nothing, except in certain theoretical branches in the High School, where no illustrations are given of the practical application of science. The Case School of Science has a name to live whilst it is dead; its managers have offered nothing but preliminary "examinations" to attract scholars from near or far. With the vast extension of industries in this country, able and capable mechanics are likely to be needed beyond the available supply. We would be glad to learn of combined and intelligent efforts being put forth to establish the apprenticeship system in our manufactories and workshops on plans already tried and found to work satisfactorily in different portions of the country. Whilst affording at the outset means of support to youth, it assures their continual improvement in special lines in which excellence is at a premium. Without it youth are apt to put up with some occupation that involves mere routine, or pass through the several departments of a shop afterwards as indifferent workmen. The apprenticeship we have in view involves technical education with practical work in the shop, and wherever the opportunity has been presented, there have come forward a crowd of applicants among whom employers have been free to make their choice.

INSURANCE FROM ACCIDENTS.

Two mutual assurance societies have been established by the employers of labor in Great Britain, to prevent litigation under the Employers' Limited Liabilities Act, by which their men are insured against all accidents, whether from carelessness or otherwise, at far lower rates than have been hitherto charged by insurance companies. This lowering of rates is justified, however, by the data they have collated, and which are of special interest. The Master Builders' Association, which has its members among the engineering, shipbuilding, iron-founding and machine trades, finds that taking the average of the past three years there were 39 fatal accidents, or 13 per annum, and 2002 minor accidents, or 667 per annum. The statement is made that 75 per cent of the accidents reported were due to sheer carelessness. We are disposed to consider this estimate too high. Carelessness cannot be determined by an actuary. The want of due preventive care on the part of employers as to the condition of engines, boilers, supporting timbers, &c., and the neglect to fence in dangerous portions of machinery, notoriously contributes to numerous disasters. Such mutual associations might be advantageously organized in this country. They would furnish the needed aid in all cases of accidents to members whatever the causes of such accidents. There is reason to believe that the percentage of accidents to the employed is lower in this country than in Europe, owing to the greater intelligence of our workmen. Low rates and ample security would be the temption to join.

THE OIL SPECULATORS.

IT is affirmed by insurance men that stock-jobbing speculators do not live out half their days, owing to the everyday worry and excitement attending their transactions. We are inclined to believe this of oil operators, looking to the constant uncertainties by which they are surrounded, as to what is the prospective demand for stock what the prospective yield, what the manipulations of the managers of the Standard and others, what the most favorable moment of disposing of their stock, or what their chances of getting the typical or real barrels of oil they have sold at a lower figure. Lately the report of a less favorable condition of the producing districts sent oil up from 97½ cents to $1 a barrel. The bulls succeeded in producing a veritable scare, but the apprehensions this excited could not be maintained, and holders bought to their loss. One influence that has operated to depress prices has been the increased activity in drilling, consequent on the returns that can be secured; another is the falling off of foreign shipments, owing to freights having been raised, and to the indisposition of vessel owners to take oil as a cargo. The trade has evidently been over sanguine as to a rapid decline of production.

A VERY considerable proportion of the increased demand for iron arises from the necessity of heavier construction in rails and railway bridges, locomotives, wheels and axles. Bridges that some years since sufficed for the traffic passing over them are found inadequate, although perchance nearly as strong as when originally constructed. Renewal, in fact, is going on at a rapid ratio. With this is combined higher constructive art, demanding more finished forms and a greater amount of workmanship. It is not surprising therefore that iron dealers should be so pressed to meet at current quotations the demands upon them, and that in face of the certainty of an increase in the ratio of foreign importations, prices should tend to advance. Far more iron than can be produced in this country is wanted, and it will come. The new railways that are being built, and the railway extensions that are being carried out, demand an unprecedented supply, both for permanent way and rolling stock.

CLEVELAND, as is well known, is a leading centre for railway supplies, but such is the pressure on manufacturers in this line that there is a difficulty in placing contracts for early delivery. New machinery and new tools are being continually sought for in our car shops, and some difficulty is experienced in getting even these supplied as promptly as exigencies demand. The mechanical activity of the country at this time is certainly remarkable.

WE give a large part of our space the present week to an exposition of the Brush system of lighting.

MANUFACTURES.

TO MACHINISTS, MANUFACTURERS AND OTHERS.

The publishers of The Trade Review solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinist and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised before sending to press.

OHIO.

The Fall River Co., Akron, have lately received 300 tons of iron.

Mt. Vernon Furnace is running, and making 14 or 15 tons of good warm blast per day.

Olive Furnace is now running and doing well, and is making 14 or 15 tons of warm-blast iron per day.

Taplin, Rice & Co., Akron, have orders for more stoves than they can fill to December 1st and are arking a rest.

The Buckeye Engine Company, Salem, will furnish a 150-horse power engine for the Brush Electric Light Company at the Chicago Exposition.

The Holt Manufacturing Company, Cleveland, have doubled the capacity of their works, and have a very liberal supply of orders for portable forges.

The Conrad Manufacturing Company, Cuyahoga Falls, are the proprietors of the Blakeslee nut and header machines, which they will shortly offer to Western manufacturers.

The Motherwell Iron Works, Lancaster, will be removed to Logan, in the Hocking Valley. The Lancaster property was valued at $12,000, and the citizens of Logan subscribed $20,000. The works will be operated by an incorporated company. The main building of the works will be 200x50 feet, and the work of erection will be commenced at once.

The Cleveland Co-operative Stove Company began the month of September, just closed, with 26,000 stoves in stock. The calls for goods have been so large that when present orders are filled some styles will be short, and the general inclinations are that the balance with all they can turn out at all their foundries will not meet the demand. They are running full at all points, with all the hands they can operate. This is no doubt due to the fact that they employ no traveling salesmen, giving the full benefit of that expensive luxury to the stove trade who buy from them, a feature which has such large advantage to buyers as to leave its effect on trade everywhere.

At the Stark County Fair, the Chieftain Hay Rake Company had on exhibition two of their finely finished rakes representing the two styles they manufacture. The one known as the Coil Tooth Rake has the most simple manner of fastening the teeth of any rake manufactured, it permits the teeth to be removed or replaced instantly, by simply removing a bolt. The other is their Drop Tooth Rake, the invention of Mr. Fred. E. Kohler, the Secretary of the Company. This rake is taking the lead in localities where the ground is rough and uneven, as the teeth can drop and pick the hay out of the hollows and pass easily over obstructions without scratching up the meadow. Another important feature of their rakes is the patent lock-lever; it forms a perfect lock while the rake is at work, a slight motion of the handle unlocks it, and the driver's weight tilts the axle and dumps the load. A boy or girl can operate it with ease. This company, though only in operation two years, has built up such a large trade by fair dealing and turning out first-class machines, that during the past summer they have rebuilt their works on a much larger scale. Their main building is 40x225 feet; these works are quite an addition to the manufacturing industries of our busy city. Two large figures of Indian chiefs (the company's trade mark) adorn their buildings, and are a sight to behold. The members of the company are Fred. E. Kohler and Isaac Harter. The company, which commenced operations on the 10th ult., will turn out about 5000 Chieftains this winter.

Pennock Brothers, Minerva, are now filling a large order for coal cars for the Toledo, Delphos & Burlington road.

The Cuyahoga Works at Cleveland have recently completed three of their 2,000 pound steam helve hammers for the Lake Erie Iron Company. These hammers are especially adapted to forging the heavy paten of car axles now so generally used by railroad companies.

At Dayton, the Mead Paper Company has built a new engine room, and has put in three new paper machines, a Gordon engine 100-horse power, and will produce 15,000 pounds per day of news and book; and the Crume and Sefton Manufacturing Company, which makes a specialty of oyster buckets and butter dishes, has made a number of changes in its factory, and is now producing new and improved goods.

The machine and jobbing shop of Ebersole & Kailey, Canton, are full of orders. Being first-class practical machinists themselves, with a strong staff and large resources there is nothing in the line of machines, machinery construction and machine repair to which they are not equal. In going through their works we noticed various complicated models being made to order.

Beecher & Smith, manufacturers of Beecher's air-heating furnaces, 16 Champlain street, Cleveland, are having a rushing business. The fact that these furnaces are positively free from dust, gas or smoke, economical, durable, simple, and that they burn either anthracite or bituminous coal, strongly commends them for adoption. Sales are made all over the Northern States. The firm are some 48 furnaces behind orders. Mr. W. F. Beecher is the patentee. The firm was established four years since.

The new pump works of the John H. McGowan Manufacturing Company, Cincinnati, are now equipped with machinery of the most approved pattern, and is in full operation. These works are increased to fully double their former capacity. Some of the new additions in machinery, including a fine engine and elevator, were built by the company in their own shops. The new works are situated on Central avenue, below Second street, comprising a substantial three-story brick building with a fine basement, the whole having a wide frontage on Central avenue. The elevator in the building is driven by hydraulic power operated by one of the "Rival" pumps, and is worked with great ease and facility. Large orders for the "Rival" are being completed with rapidity, while other pressing orders are waiting their turn.—*N. Y. Iron Age.*

Some extensive improvements have been made at the Akron Sewer Pipe Works. A number of large brick smoke stacks, a large extent of pipe racks, etc,. have been built.——J. F. Serberling in erecting the addition to his mower and reaper works, Akron, has concluded to enlarge the original plans and is now engaged in putting up a three story brick addition with basement, 46x150 feet in dimensions. The entire shop will soon be put in operation for next season's machines, the number of which to be made has been placed at 5,000. Owing to the great rush of business and the scarcity in building material the new office in connection with the works spoken of some time since, will not be built until spring.——The Whitman & Barnes Manufacturing Company, Akron, are now occupying their new shop, and the new engines are working admirably. This shop is now among the most extensive in the city.——Aultman, Miller & Company, Akron, manufacturers of the Buckeye Mower and Reaper, are engaged on the large addition to the east end of their works. The shop is running full handed on next season's work. —*Akron Beacon.*

How Long Would it Take to Count Two Millions ?

Over two million volumes of the revised edition of the New Testament were sold on the first day of its issue. These figures can only be equalled by the enormous sale of Swayne's Ointment for Itching Piles, which is universally used as a standard remedy for stopping the itching at night, when one thinks that pin-worms are crawling about the rectum. To calculate the extent of its sale in actual figures would involve the labor of a lifetime. Will you be pestered longer from the aggravating Piles?

The extensive new car works at Elkhart, Ind., will be ready about November 1st.

CORRY.

The Boiler Works of Messrs. P. I. Lynch & Co.

A visit to Corry within the past few days revealed the fact that the firm of P. I. Lynch & Co., boiler makers, were doing a large and thriving business. The building occupies a space of 54x100 feet, and every available spot is put to some use. Mr. B. I. Lynch, the senior member of the firm, carried on the business of boiler making for five years in Petrolia, consequently understands his business very thoroughly. The business increased rapidly and to such an extent that preparations were made to erect buildings and commence operations in Corry, and last December, everything being in readiness, business was commenced in good earnest. Men who were well posted in the art of boiler making were secured, and at present from twenty-five to forty hands are kept busy the year round. Orders began to flood in and the firm have been obliged to build a new addition to their already extensive buildings, in order to do their work and fill the orders which are rapidly increasing in numbers. In addition to the manufacture of boilers the firm repair all descriptions of plate iron machinery and act as agents for Chamber & Taylor's (Indianapolis) Side Cutting Mulay Portable Saw Mill. The local trade of the firm is now quite extensive, and it is rapidly increasing. The reputation which they have built up in this short time is evidence enough that their work is far superior to that usually put up in this vicinity. The superintending is done personally by Mr. Lynch, who is a practical man at the business and a gentleman who can be relied upon. Messrs. Cypher, Gilbert & Covell, the other members of the firm, are all "go-ahead" business men, and of that stamp who are bound to succeed in whatever they undertake.

The Postal Business of the World.—A German paper has been compiling the statistics of the world's correspondence by post and by telegraph. The latest returns which approached completeness were for the year 1877, in which more than 4,000,000,000 letters were sent, which gives an average of 11,000,000 a day, or 127 a second. Europe contributed 3,036,000,000 letters to this great mass of correspondence; America about 760,000,000, Asia, 150,000,000; Africa, 25,000,000; and Australia, 50,000,000. Assuming that the population of the globe was between 1,300,000,000 and 1,400,000,000, this would give an average of 3 letters per head for the entire human race. There were in the same year 38,000 telegraph stations, and the number of messages may be set down for the year at between 110,000,000 and 111,000,000 million, being an average of more than 305,000 messages per day, 12,671 per hour, and nearly 212 per minute.

French Gutta-percha.—This is the name applied to a gutta-percha substitute obtained from the outer portion of birch bark by boiling it in water over an open fire and then evaporating this extract, when a black fluid substance remains, which soon becomes hard and compact by contact with the air. It is said to have all the best qualities of gutta-percha, does not crack like the latter, is stronger and cheaper. It can even be combined with gutta-percha, which is improved by this adulteration.

Mr. J. F. Raines, who operates a saw mill about a mile from Fisherville, in Augusta county, which he moves from place to place according to the material the locality furnishes, has done with one engine in the last ninety days the following work: Sawed 100,000 feet of lumber and 1,300,000 barrel staves. He has shipped 700,000 staves and 14 car loads of tan bark, and is turning out 20,000 staves per day. Such a record for a single engine is unusual.—*Southern Industry.*

Big Results from Little Causes.

"Do you know," remarked a man to his friend on Chestnut street, a day or two since, "I believe both Conklin and Platt had a bad case of skin disease when they resigned!" "What makes you think so?" inquired the listener, in astonishment. "Well, you see, they acted in such an *eruptive* manner—so *rash*-ly as it were. Save?" "Oh! yes, I save," replied the other; "they were *boil*-ing over and merely resigned to *humor* themselves, I suppose." If such be the case the national difficulty might have been averted by applying Swayne's Ointment for skin diseases.

ELECTRIC LIGHTING.

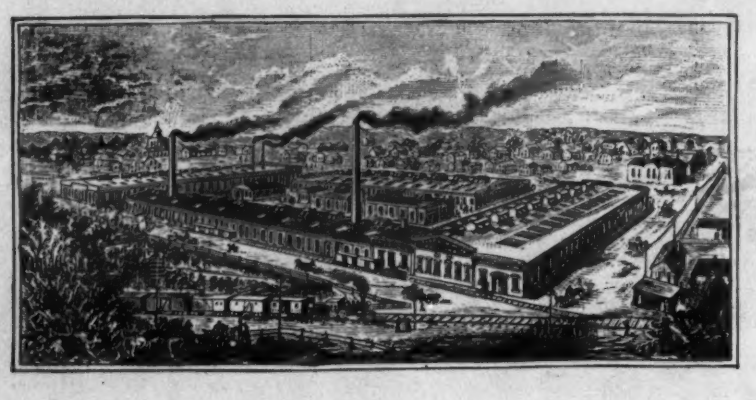
ITS PRESENT AND FUTURE.

EXPOSITION OF THE BRUSH SYSTEM.

"LET THERE BE LIGHT."

The history of the world, moral, intellectual and physical would seem to have been one continuous struggle from darkness into light. The inconvenience to which former ages as well as late generations were subjected becomes apparent in the full glow of the Brush electric light. Pine torches, pitch, resinous distillations, and animal oils supplied with wicks of pith, were the earliest means of artificial light; to which succeeded chemical combinations of volatile substances, some intermixed with certain resistants to check too quick consumption; and tallow, wax, spermaciti and other descriptions of candles which held their own till such time as gas, evolved from coal, amazed groping humanity. Gas itself was not adopted without much misgiving as to its supposed explosive quality, but the necessity for "more light," quite irrespective of cost, won the day; and now to the balloonist passing over American or European cities at night, these hives of beings present the appearance of being all ablaze with the multitudinous jets of flame. In its turn, the vapory coal product "pales its ineffectual flame" before the electric light. Nowhere is the contrast more striking than in Cleveland itself, where darkness "such as may be felt," is experienced in passing from the radii of the wide circumference of light given forth by the lamps in the Public Square and Superior street. So excellent is this light, so perfect the system, whether for the illumination of outdoor spaces or large interior areas, that none can doubt that the age of electric lighting is upon us. Whilst we find every one anticipating that the

electric light will presently supersede gas, there yet exists in the popular mind a prevailing vagueness of apprehension as to the means by which the current sent forth by the dynamo-electric machine is made effective, and even as to how that current is generated, divided and governed, as well as to the fuel consumed and the mechanical arrangements by which the exact quantum of carbon fuel is furnished. Accordingly we feel we do a general service in expounding the Brush Light system, by



aid of various engravings. We select that system because within the spheres we have designated it must be considered as comparatively speaking perfected, which cannot be affirmed of other systems applied in a tentative way to the lighting of streets, manufactories, &c., regard being had to the purity, clearness, brilliance and commercial economy of the Brush light.

ECONOMY OF THE BRUSH SYSTEM.

No electric system can succeed that does not comply with the commercial condition of economy. In dealing, however, with the question of economy, it is not simply the first cost that must be taken into account but the superior advantages attending the light itself. The Brush light in turning night into day, so far as clearness of vision is concerned, adds to the efficiency of manual labor as in dock and railway station work. The pedestrian, too, where this light is applied to squares, avenues and streets must credit it with the absence of that uncertainty which attends him through the half illumined routes where gas is used. Every pebble and grain of earth, every road rut, indentation or undulation of surface is made visible. That it can be made to vie in cheapness with gas has already been proved in Cleveland and other United States cities as well as at Montreal, Canada, and various cities in Great Britain, including London, as well as on the Continent. This has rendered the Brush system a commercial as it is a physical success,and by physical success we mean the maintenance of a uniform degree of brilliance, with an hitherto unapproachable clearness of lustre. The Brush dynamo electric machine renders available all but the slightest appreciable percentage of the electric energy developed, in a way we shall presently indicate, and in this respect goes far beyond any other that has been produced or can be produced outside the Brush patents, there being no two ways of doing the same thing right. Hence the great advantage which the Brush Electric Light Company holds in the electric field in regard to its adoption.

EARLY SCIENTIFIC INVESTIGATION.

Mr. Brush owes his success to an inborn tendency to go straight to his object, availing himself simply of his own personal investigations, and disencumbering himself of the detailed work of previous investigators, seizing on the principle involved and applying it in the course of laborious researches. The study of electric phenomena commenced in his boyhood. When only thirteen he was experimenting in the field of optics, which concerns the disposition of rays of light, and, thoroughly practical, he even ground his own lenses. His youthful efforts in the electric line have developed into valuable inventions. One significant fact is his paying a blacksmith, while yet a boy, to bend an old iron rod which he designed as an electric magnet. A scientific journal which has busied itself in obtaining details of Mr. Brush's career informs us that "young Brush also constructed a number of induction coils and sold them to his schoolmates for 'shocking' purposes." Among his other accomplishments was devising a method for lighting and extinguishing the jets of street lamps. Two years later we find him a student of the High School, Cleveland, employing his leisure hours on electric, batteries, microscopes and telescopes. The theoretical and practical were thus singularly combined, the rarest possible union in the field of physics, which deals strictly with natural elements and their forces. In 1875 the attention of Mr. Brush was directed to the subject of electric lighting. The Gramme and Siemens dynamo electric machines had already appeared and engaged the attention of the scientific world. In a conversation with Mr. G. W. Stockley, of the Cleveland Telegraph Supply Co., Mr. Brush expressed so much confidence in his ability to supersede those systems of generating the current that the Company, at the instance of Mr. Stockley, who deserves credit for his keen sagacity, advanced the requisite funds. Thus financially fortified, he disappeared from view, till some weeks later he presented himself at the factory with a model which was at once set up. Power being applied, Brush's first dynamo-electric machine gave forth a current producing a light of 300 candle power, which burnt steadily as well as brilliantly. That model, perfect in mechanical construction is to this hour at work. Though it has been improved upon by Mr. Brush, it embodies the main features of his invention in the dynamo-electric generator. By intuition, study and personal tests made at every point, he struck from the first the right path. Many of the most valuable discoveries have been made by chance; Mr. Brush proceeded by strict scientific investigation aided by mechanical aptitude of the highest order. Mr. Brush has the rare faculty of conceiving his methods of procedure so clearly that without making any preliminary sketches, he directly proceeds with the complete working drawing, with full details to scale, ready for the pattern maker.

The successful achievement of Mr. Brush in inventing his dynamo-electric machine led to the formation of the Brush Electric Company, the parent company, which has the sale and exclusive right for this country to manufacture the various electrical inventions of Charles F. Brush. This Company gives exclusive licenses. Its policy is not to demand full payment of the estimated value of a license, but to take part payment in capital stock, thus indicating its confidence in results. It depends to a great degree on the financial success of the companies it starts into being; in other words, on their earning power, and thus encourages business men and capitalists. It is noticeable that the members of the Brush Light Companies in the leading cities of the Union comprise some of their most prominent men.

THE BRUSH WORKS.

In another column is a view of the extensive Cleveland works of the Brush Light Company. They are situated in close proximity to the Pittsburgh railway, and in addition to ample space, have the most complete interior arrangements. Many of the machines used have been invented or improved on by Mr. Brush. They are the largest electric works in the world, and in every respect the most complete.

VICTORY IN THE LAW COURTS.

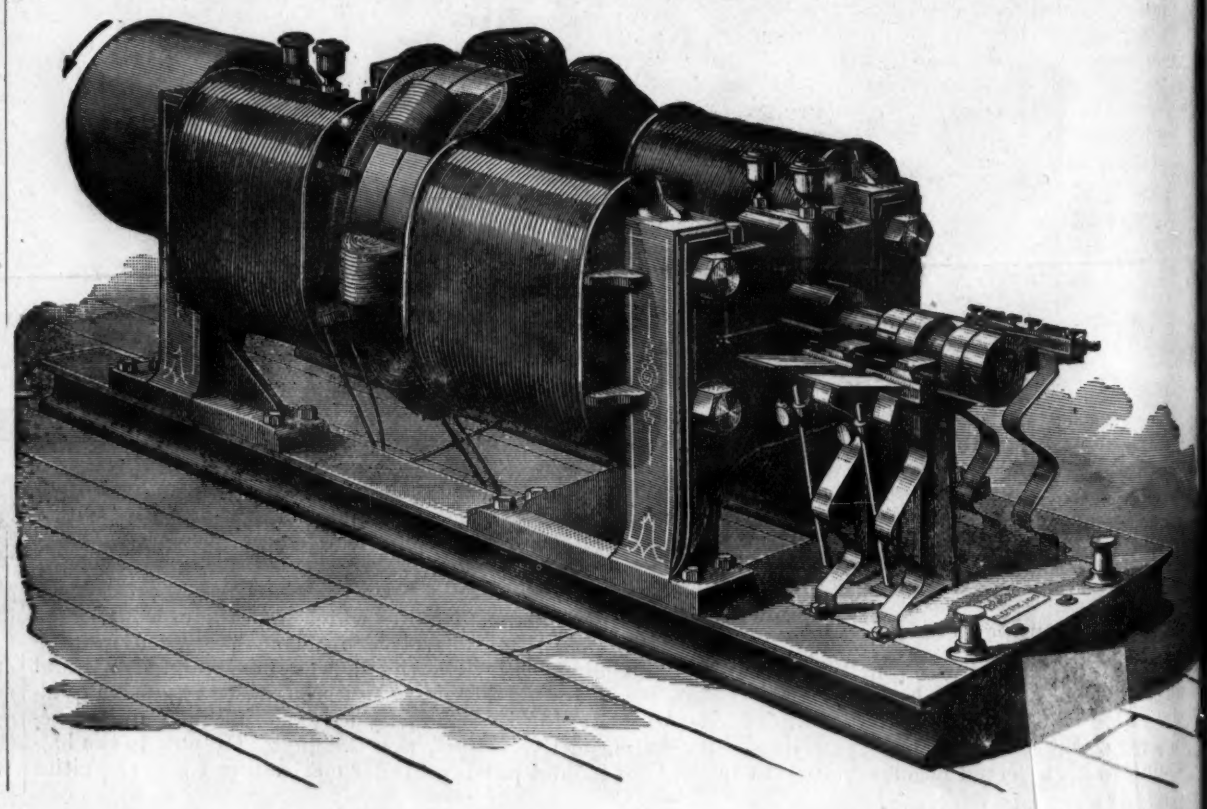
The originality of the system of Mr. Brush, its advance in detail and in entirety beyond anything previously realized, has not afforded him immunity from legal contests as to the validity of his patents. The monetary prize attending on success was too great not to excite cupidity. There will be always those who see in any serviceable invention the germ of some suggestive dreamy thought of what was possible, or which they aimed at but failed to carry out practically, or find in a valuable invention or group of inventions just what was wanted in their idea to make good some abortive attempts of their own. Again, on the part of promoters of and investors in electric schemes, the monetary prize in view has proved a strong incentive to the attempt to invalidate the claim of certain of the inventions of Mr. Brush,—inventions which are integral portions of his system—to exclusive use. At every point, however, Mr. Brush has established fully and irrevocably the originality of his methods, and none of the multiform inventions combined in his system dare be infringed on.

THE BRUSH SYSTEM OF LIGHTING.

By the Brush system any number of lights from 1 to 40, each of 2000-candle power, or any number from 1 to 12, each of 6000-candle power, or a single light of 80,000 or more candle power, can be produced from one dynamo machine. The connecting wires may be extended over circuits of many miles, and one machine, known as No. 8, maintains forty lights of 2000-candle power each upon a circuit of ten miles in length of copper wire. By using a larger wire the distance can be extended to 25 miles. With the largest sized Brush machine forty powerful electric lights are burned in one circuit, with an absorption in the machine of thirty-six horse power. It has been truly remarked by a scientific contemporary that no other system of lighting can maintain one fifth of this number of lights on one circuit; and most are confined to a single light to one machine. It adds that the Brush Electric Company of Cleveland have done more since 1876 to place the business of illumination by the electric light upon a practical and substantial basis than has been done in this direction by all other inventors.

BRUSH'S DYNAMO-ELECTRIC MACHINE.

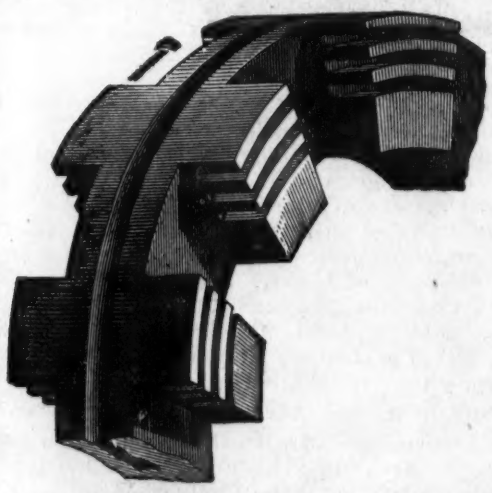
The accompanying engraving is that of the Brush dynamo-electric machine, on the construction of which rests a large portion of the fame of the inventor.



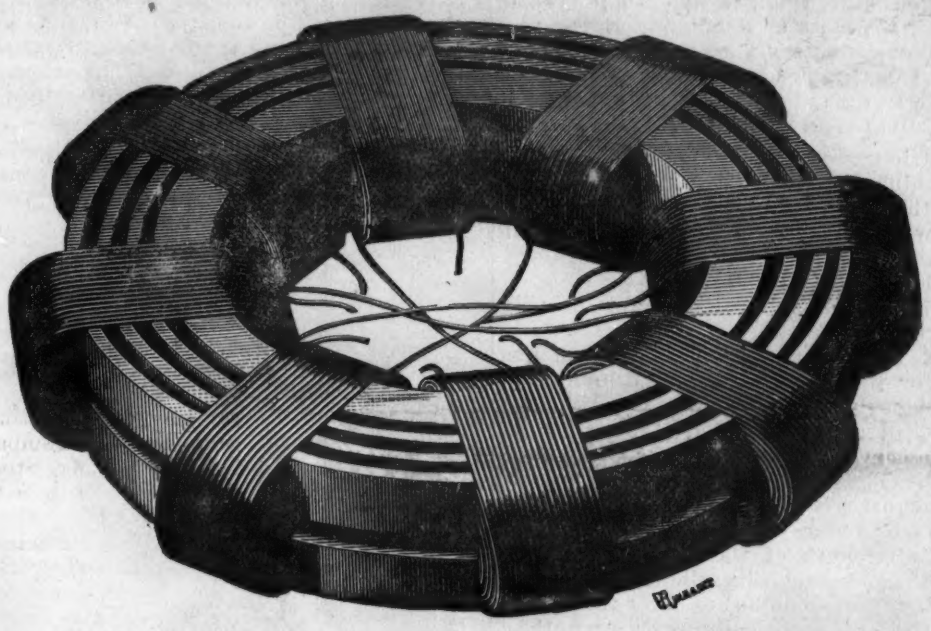
The transmission of electricity depends on the dynamo-electric machine which itself is operated by steam as a motor. The current generated by rapid rotation, and successive reversals of magnetism of coils, is passed into another set of coils which rotate in an opposite direction. This much is true of all dynamo-electric machines, but the incontestable superiority of the Brush machine is manifested in a number of points. The arrangement of the armatures is such that their entire surface is constantly presented to the poles of the magnets, thus securing uniformity of magnetization as well as maximum amount of power. In the Brush system the first current is positive or direct during the first movement; the second movement gives rise to a negative or inverted current; the third movement continues this negative current; the fourth renders the electric energy again positive or direct when it sets forth on its mission of illumination. With other dynamo-electric machines than those of Mr. Brush at least 50 per cent of the power developed in the first set of coils is expended in transfer to the second, there being in fact no complete delivery, and power is lost in only a partial return of the coils to a de-magnetic or neutral state. Should an intense current be generated in other machines there arises a loss of power from the heating of the working parts, affecting the volume or force of the current, and not only is power lost but they must be run comparatively slow. Hence it is absolutely impossible that except by multiplying sections, and with wholly disproportionate results to outlay, they can develop that intensity, strength and steadiness of light which is the conspicuous feature of the Brush machines. The projecting portion of the armature between sections of the wire is made to revolve very close to the poles of the magnet by which means the inductive force is fully utilized. The deficiency of induction in the Gramme and other machines is notorious. In the Brush machine the insulating cylinders are opposite each other and alternate with the metal segments which connect the sections of the armature. In each section the electromotive force quickly increases to its maximum and this force is constant until the section is near the neutral point of the succeeding section when it rapidly falls to zero. Free from the serious disadvantages attaching to the Gramme machine which does not prevent the induction of currents in the iron itself, the electro motive force developed in the conductor of the armature of the Brush machine is sufficient to maintain a normal resistance twenty times as great as its own, an unprecedented achievement which no other dynamo-electric machine can reach. The armature at its normal speed makes seven hundred and fifty revolutions per minute An enormous advantage is gained in the provision made by Mr. Brush for preventing the action of the machine being clogged, so to speak, with heat. A disadvantage attending the covering of other armatures by wire is the slow escape of the heat. Mr. Brush exposes the greatest possible surface of the armature to the air, and all the heat evolved by the coils being successfully magnetized and demagnetized, is rapidly dissipated. Two plates or brushes, one of which is positive, the other negative, collect the electricity generated by the revolutions of the armature. We have to add that the Brush machine is less cumbersome and costly than any other that has established even partial pretensions to use.

THE ARMATURE RING.

The following is a section of the armature ring



which is seen complete in the succeeding illustration with the distribution of the coils around the

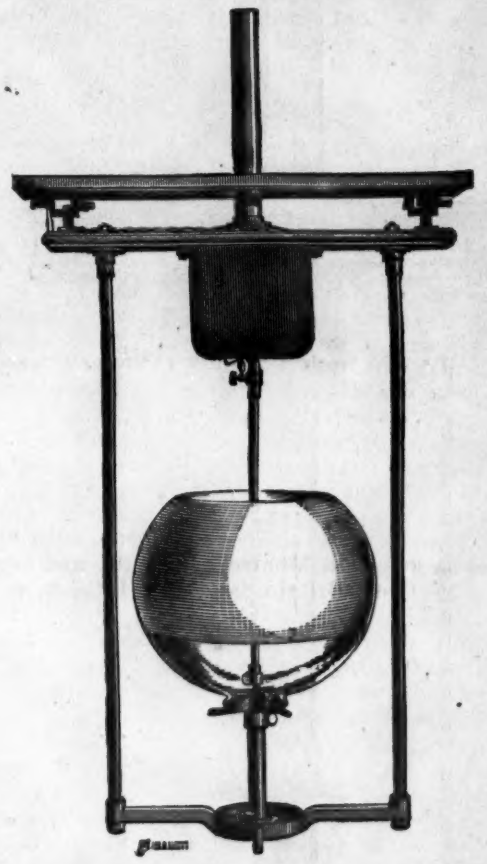


ring, and showing how connection is made. It will be observed that deep concentric grooves have been cut out. This is not only for the purpose of lessening the weight but of affording ventilation. The parts of the ring are insulated from each other in such a manner as effectually to prevent the induction of currents in the iron itself when it is revolved in a magnetic field. The eight bobbins of armature conductor wound round the iron ring, and whose planes radiate from the axis of rotation, an arrangement quite different from other machines—are isolated from each other, and as the field magnets of the machine face both sides of the armature, in the plane of its rotation, thus both sides of the flat bobbins of armature conductor are exposed to the direct inductive influence of the magnets. Another point of the invention is that the field magnets of opposite polarity are applied to diam etrically opposite points of the annular armature, which then consists practically of two semi-circular magnets, having their like poles joined. The arrangement allows of a greater number of convolutions, greater magnetic saturation and greater intensity of action than is otherwise possible.

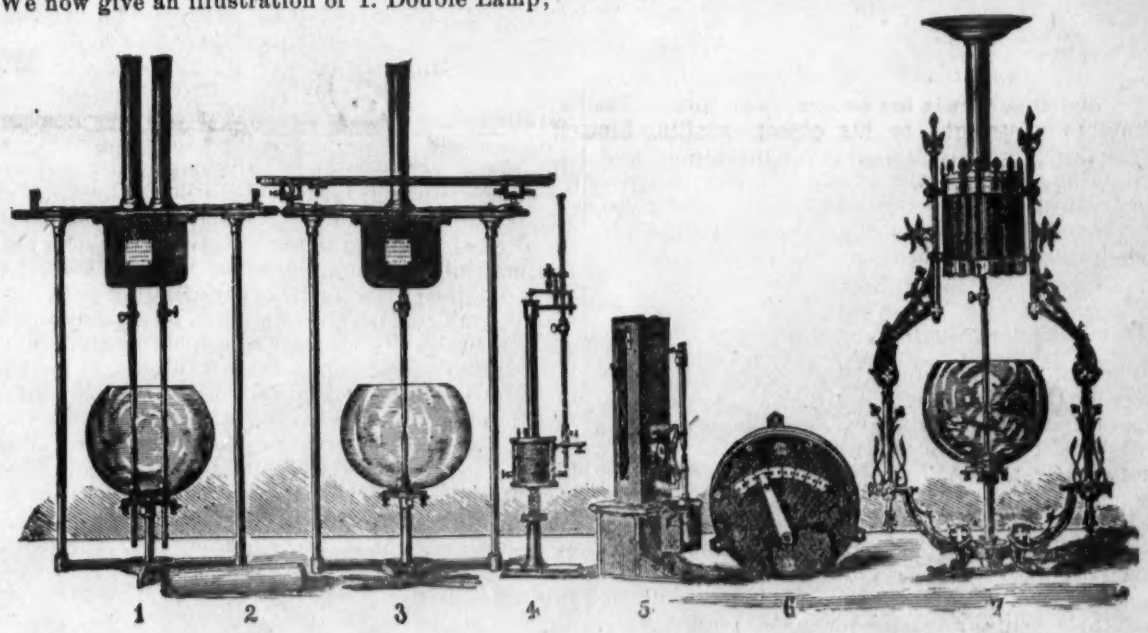
THE BRUSH LAMPS.

At every point of Mr. Brush's system are presented the evidences of his inventive and constructive genius. The originalty and practical character of his improvements are strikingly exhibited in the means he has adopted for generating, dividing and regulating the current and rendering each light in a circuit independent in a manner of the rest, so that either its extinguishment, as on occasion of renewing the carbons, would not affect other lights. Even the carbons themselves in construction are his invention. The carbon pencils consumed under the Brush system are, before being used, about a foot long, and are electro-plated with a thin covering of copper; they last about eight hours, during which time about 9½ inches of the positive and about 4 inches of the negative carbon are consumed. Each lamp is connected with contacts and switches for cutting off and letting on the current.

We now give an illustration of 1. Double Lamp; 2. Carbons; 3. Single Lamp; 4. Focusing Lamp; 5. Head-light Lamp; 6. Dial Attachment to Machine; and 7. Ornamental Lamp. So complete is the system of lighting, that the number of lights in circuit does not affect the speed of the dynamo electric machine, or demand any different adjustment of lamps. The accompanying view is that

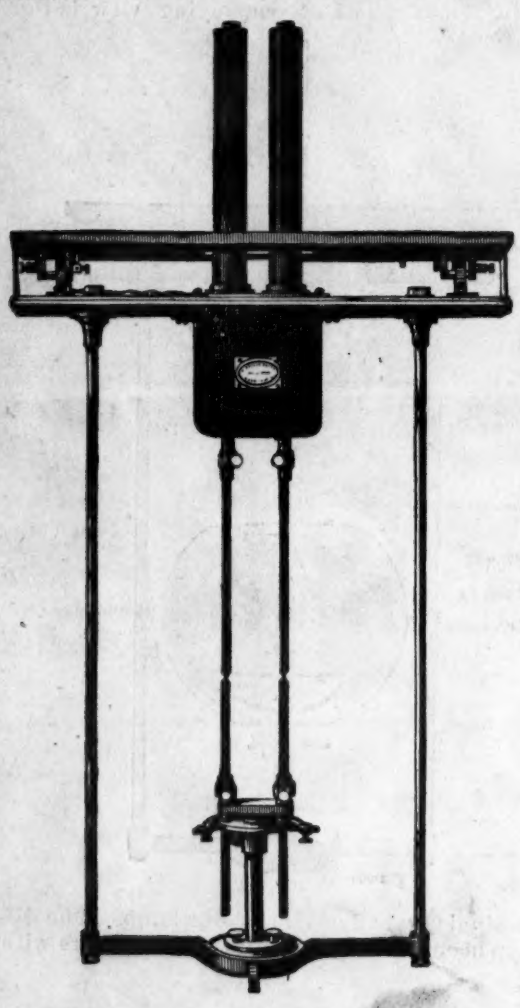


of the single carbon or eight hour lamp. The difficulty encountered by all previous inventors with



the carbons had been in their proper adjustment as to relative distance so as to properly regulate the arc. Mr. Brush has depended on the force of gravity alone. The position of the carbons is controlled solely by the influence upon a bar of iron of a magnetic field, the intensity of which varies with the electric current passing through the lamp circuit. Nothing can be imagined more beautifully simple than this adjustment, the endeavor to accomplish which has racked the brains of the first mechanicians of the day, who have employed clock work, &c., for the purpose.

In a circuit of lamps burning simultaneously there are of course different resistances, which present complex difficulties, which Mr. Brush has fully met. For purposes of general illumination the lower carbons in the Brush lamp are fixed, the upper carbon descending the exact distance required for the continuance of the arc as consumption proceeds. The tendency of the arc to become longer and increase its resistance as the carbon burns away is overcome by an automatic diminishment of the strength of the current, lessening the power of the magnetic helix, allowing its plunger to descend, and in so doing to lower the carbon and shorten the arc until the proper strength of the current is restored, when the rising of the plunger once more holds the carbon in position. The extreme sensitiveness of the action thus brought about will be best appreciated by electricians.



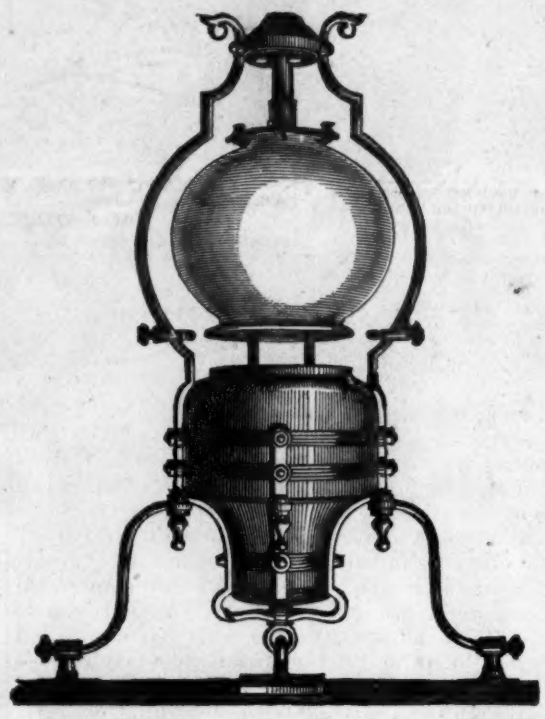
The above engraving is a view of the double lamp, which with two sets of carbons doubles the length of time in which the lamp will burn. The transfer of the electric arc from one set of carbons to the other is instantaneous. This double lamp maintains the light fron 14 to 16 hours; whereas the greatest length of time for combustion by other systems is 6 to 8 hours. Only one pair of carbons burns at one time.

THE TOWER SYSTEM.

(See Full Page Engraving.)

The tower system of electric lighting which provides for the display of the Brush light from eminences that will illumine whole sections of cities is destined to be brought into extensive use. In the tower system, Akron, which is fond of pioneering new and substantial enterprises, has been the first of Ohio cities to adopt it, and with splendid results. The Brush Electric Light Company of New York has erected two towers, from which two electric lamps, each of 6000-candle power, will diffuse their brilliant rays over an extended area. We furnish a page illustration of the electric light tower in process of erection in the Public Square of this city. Its commanding eminence will allow the rays to reach the Lake shore boundaries of the city. Cleveland appropriately was the first city in the world to adopt the electric light for out door illumination, and the complete supercession of street gas lighting here is but a question of time.

Appended is a view of a double lamp admirably suited for interiors.



MERITS OF THE BRUSH SYSTEM.

The merits of the Brush system may be thus summarized: The ready and economic conversion of mechanical power into electric energy; the capacity of subdivision of the current; the perfect adaptation of the current to the requirements of the circuit, such an automatic regulation of the circuit that the extinction of one light in no degree affects the rest; the maintenance of a steady, durable flame; finally, the Brush system is the only one by which a large number of powerful electric lights can be burned in series, upon a single circuit of wire, and this with constancy and simplicity, and at a less cost than any other system. In the systems in favor in England and France there are as many separate conductors of electricity as there are lights, and any loss of resistance by the current falls on each single lamp. In the Brush system one pair of conductors is sufficient for all the lamps.

THE ADOPTION OF THE BRUSH LIGHT.

The world is too practical to be found wanting in appreciation of what really subserves its purpose. It has undoubted wants to be supplied, and those who can discover and best meet these will be best rewarded. But general spontaniety of adoption is not to be looked for. Transitions are always slow till a certain impetus has been acquired. Gas had to wait long for adoption by civic authorities, and private individuals slowly followed in their wake. In view of the tenacity of habit and custom, it is of no little significance that at this early stage of the Brush Light, 10,000 Brush lights are already in use in this country. Large as are the Cleveland works, it may be doubted whether they could have successfully encountered a greater pressure on their resources than has taken place. The organizations to which the parent company disposes of local rights for cities and districts are fast multiplying, and so supreme are the advantages obtained from the Brush system, that notwithstanding all the passive and active opposition of gas companies, its general adoption for all public thoroughfares where gas is now used and for all large interiors is but a question of time. So with the illumination of wharves, docks, warehouses, stores, factories and establishments of various kinds. Its adoption is facilitated by the ample evidence afforded that it can compete in cost with gas, the reduction being in proportion to the scale of operations, whilst the superiority of the light in clearness and brilliance is a decided factor of value, which would assert itself even were the cost higher than gas. Further than this, where used for interiors, the health and comfort of workmen, and the non-vitiation and non-heating of the air, are of prime importance. Wherever used in industrial establishments the testimony from workmen concurs as to the preference they give it over gas. With it they no longer simmer in gas jets or inhale noxious vapors; besides which they find they can do their work better and more expeditiously. Manufacturers themselves cannot fail to take into account the exemption which this light assures from all risks of fire, as well as its absolute cleanness which stands in contrast with gas or coal-oil. Whole columns of our paper could be filled by a simple enumeration of rolling mills, iron and steel works, machine shops, textile and other factories of various kinds, mines, smelting works, lumber and saw mills and stores, ferry boats, steamers and hotels, in which the Brush light is used, with the addition of railroad companies who have adopted it, and of docks, parks and summer resorts in which it has been set up. States in which electric lighting companies are operating lighting stations in various cities are New York, Massaschusetts, Rhode Island, Pennsylvania, Maryland, Virginia, Ohio, Indiana, Illinois, Michigan, Louisiana, Colorado, Utah, California and Texas, etc.

THE FUTURE OF THE BRUSH LIGHT.

Any unsteadiness ever perceived in the Brush light is not due to any defect in the system itself, but the unsteadiness of the motor power, and the Brush Electric Company is in a position to give directions as to the special construction of engines to drive its dynamo-electric machines. Such has been the success attending this system that we believe in a few years it will be introduced into every city and town of any importance both in this country and Europe. The comparative novelty of the electric light for purposes of general illumination occasions in many localities some delay in adoption, from the vague impression that some better system will turn up. Those, however, who have studied the Brush system must be fully satisfied that it will never be superseded. How can it be otherwise in view of its capability of turning all but a tithe of the power generated into light; of securing intensity and strength without wasteful loss, and of automatically regulating the supply both of the current and the light? Then as to cost. We learn from the carefully prepared statistics, published by the Lords of the Committee of Council of Education, England, that whilst the cost of gas in the Court of the President of the Kensington Museum, London, amounted to $2,500, the sixteen Brush lights which now supply its place cost annually but $286. These figures cannot be appealed from. The light is besides commended in this report for not injuring interior decorations. The Brush system gives more light for the same expenditure of power than the systems of Jablochkoff, Werdermann, Jamin, Siemens, Weston, Gramme, Lontin, Noallon, Meritens, Suisse, Wilde, Swan, Edison, Maxim, Arnaud, Crompton or Brockie. In the present trial of three systems by the corporation of London—those of Brush, Jablochkoff and Siemens, the Brush light is found to be not only the cheapest but the best. Civic bodies never move quickly unless pressed, and it is for oppressed users of gas everywhere to awake to their own interest, and organize for lighting stations. We may mention that wherever the Brush light has been introduced into dry goods, clothing and furnishing stores an enormous saving has been effected simply through the absence of the deterioration of textile and other articles from the fumes of gas. In fact, this light is at present the only one that is at all suitable for warehouses and factories in which tints of colors have to be manufactured or matched in any way, as in paper mills, textile factories and silk dye works. For public libraries and picture galleries this light would be invaluable, not only on account of economy and the fact of the colors remaining unaltered from daylight, but because there are no injurious products of combustion given off as gas, the sulphurous fumes of which are fatally destructive to works of art and choice bindings of books. Practically there is an unlimited field for its extension to hotels, clubhouses, business places, and private houses. We notice that the London Brush Light Company supplies, when required, incandescent lamps.

STORAGE OF ELECTRIC ENERGY FOR MOTIVE POWER.

The discoveries of Mr. Brush have not been confined to the invention of his unapproachable dynamo-electric machine for the production of electric currents, or to the intermediary means for furnishing the light, but have extended to the successful

storage of power for motor purposes. He has discovered the means of supplying electric power, on a large or small scale, available for any given purpose, and at the same time of holding this power in reserve, so that it will not be wasted when not in use and be ever ready at command. All as yet known to the world in general is that the dormant electric energy is concentrated in plates of metal, simple or composite. The value of the invention lies in the economy attaching to the production and use of this stored power. A central factory in each city in which the reservoirs shall be charged, will dispense with the use of the steam engine for a vast variety of industries, and will end in superseding manual labor to a yet greater degree. In this department of the practical application of electricity, Mr. Brush is again in the van of inventors. The systems so far announced rather than brought out in Europe have not stood the commercial test of economy. It is evident that with the Brush electric machine the work of storage itself can be performed more rapidly and steadily than by any other, whilst the store reservoir itself, with its stock quiescent and unwasting when not in use, answers every required condition. In addition to storage of electricity, Mr. Brush has invented an apparatus for producing power from the electricity thus stored.

POSSIBILITIES OF CAST IRON.—There is a class of cast-iron work that formerly was imported more extensively than now, which gave us minute articles of use, and even ornamental appendages to dress, so light in weight and so apparently fragile in form as to suggest fine hand labor. It was supposed, says *The Metal Worker*, that we had no material or means to reproduce such diminutive and fragile articles from cast iron. But recent improvements, both in material and manipulation, prove that we can almost equal the delicacy of what is known as "Berlin iron." Fine charcoal iron possesses wonderful properties of fluidity when in a molten state; it finds its way into the smallest interstices of the mould, and comes out cooled, a definite reproduction of the imprint of the pattern. So exact is this reproduction that bare lines, to be represented only by very fine wire, come from the mould perfect in form and quite tenacious in texture. Articles of cast iron, cast in a mould of sand, which require fifty or a hundred to balance a quarter pound weight, are as readily produced here as articles weighing pounds. It may be doubted if any metal is capable of producing more diminutive objects than iron. As instances of the possibilities of charcoal iron in castings, let any one examine the delicate shoe-buckles and belt buckles, the shawl-clasps, and ornamental hairpins, called steel, which bear a burnished surface rivalling that of silver. He will find they are of cast iron very brittle, and showing a bright iron fracture. Quantities of these articles are made in England. They are said to be cast in sand moulds, the same as masses of iron are cast, and that come out as perfect as the heavier castings. In short the possibilities of cast iron range from the utmost capacity of adjoining cupolas, capable of melting thirty tons, to the hand-ladle that with ten pounds of metal, pours for a thousand separate articles.

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MARKETS.

FINANCIAL.

Office of the TRADE REVIEW.

FRIDAY EVENING, Oct. 7.

Business in monetary circles has been active. The ruling rate of discount in bank is 7@8 per cent. Call loans are negotiated at 5 per cent., and some prime business paper is placed at 6 per cent, money being freely offered at these rates.

IRON.

Brands of iron of either foundry or mill for immediate delivery are in light supply. Contracts for future delivery are taken only at the quotations at the time of the delivery, and prices have an upward tendency. Furnacemen look to a good business for the rest of the year Elsewhere will be found our quotations of American pig. Scotch pig has advanced We quote Eglinton at $22.50@$23; Langloan, $25 00@$26.00; Gartsherrie, $24.50@$25,50; Carnbroe, $23. Old rails are in good demand and have advanced to $32 for American and $30 for foreign. In manufactured iron an active demand continues for plate. In steel we quote: Best English cast, 14@15c.; American do, 12@12½c.; Bessemer machinery, 5@6c.; Wedge and German, 7c.; English spring and calking, 7¼@7½c.; do, do American. 5½@6c Tire, 4@4¼c. Sleigh shoes, 3½@3¾c,

CINCINNATI.—(Reported by Rogers, Brown & Co.) The market continues strong, with a good demand and but few offerings Good forge and foundry irons of standard brands are difficult to obtain at outside figures. Car Wheel irons are also well sold up, and there is a more active demand. We revise quotations to cover actual transactions of the week: Hot Blast Foundry Iron—Hanging Rock charcoal No. 1 $27.00@28.00, 4 mo.; No. 2, $25.50@27, 4 mo.; Southern No 1, $25.50@27,4 mo ; Strong Coke, No. 1, $23.50@25,00, 4 mo.; No. 2, 23.50@24.00, 4 mo.; No. 3, $21.50@22.50, 4 mo.; Soft Stonecoal No. 1, $22.00@24, 4 mo.; No. 2, $20.50@$22.50, 4 mo Forge—Strong Neutral. No. 1 Mill, $22@$25, 4 mo. Cold Short, No. 1, $20.00@22.00, 4 mo. Car Wheel and Malleable—Hanging Rock Cold Blast, $37@41, 4 mo.; Hanging Rock Warm Blast, $29@32, 4 mo.; Southern Car Wheel $33@38, 4 mo.; Lake Superior, Car Wheel Iron, $33@35, 4 mo.; Lake Superior Malleable, $33@$35.

CINCINNATI.—(Reported by E. L. Harper & Co.)—The market continues to grow steadily stronger. Stocks in the hands of sellers are very light and some grades have been sold at an advance of 50c. to $1 per ton.

INGOT COPPER.

Market quiet but firm, We quote ingot copper at 18¼@18½c.; Sheathing, 24c.; Braziers, 26@28c.; Bolt, 26c ; copper bottoms, 27@28c.; American yellow sheathing metal, 17c.; Y M. bolt. 20c.; English yellow sheathing metal, 14c. in bond.

LEAD.

Consumption continues on an ever enlarging scale. There are no indications of increased supplies. We quote common 5¼@5¾c. and refined at 5¾c. Foreign lead costs about 5¾c. laid down at New York.

SPELTER AND ZINC.

Spelter is very quiet but strong at 7¼c. Sheet zinc is very scarce, quiet, and strong at 7¼c.

TIN AND TIN-PLATES.

For tin the demand is active. We quote 21¾@22¼. Large lots sell at 21½c. English, 23c. For tin plates the demand has been fair and prices firm. We quote charcoal bright at $6.25@$6.50. Ternes at $5.75@7.25; Cokes $5.35@$5.55; do. Ternes, $5.25@$5.50

COAL.

There have been large deliveries and a good demand for local use and shipment. Domestic sizes of coal are likely shortly to advance. A scarcity of cars in bringing coal to Cleveland continues to be complained of. Lake vessels are scarce and rates of freight high. We quote: Brier Hill coal, $3.50@$4.00; Willow Bank coal, $3.15; Fox Lake, $3.15; Massillon coal, $3.00; Cannel coal, $3.75; Blossburg, $4.00; Carbon Hill; $2.90; Straitsville, lower vein, $2.80; Shawnee, f. o. b. at Sandusky, $2.80 Following are car load prices to dealers on track: Massillon lp, $2 85@$3.00; Massillon nut, $2 50@$2.75. An early advance is anticipated.

HARDWARE.

Jobbers find little occasion to complain. The activity of the demand extends to all descriptions of tools; also to sheet metal and pipes connected with stove heating. For nails the market continues strong at the rate to which they were advanced by the Western Nail Association, namely $3.25. The purchases of stamped tinware are greater than at any former season. The advance in the discount of bright wire goods to 60 and 10 per cent has not affected consumption. The same is the case with wrought iron staples, hooks and staples, hasps and staples, meat hooks, open links, etc , which were advanced last week to discount 66⅔ and 10 per cent. Various changes are announced in discount sheets.

LUMBER.

Transactions in lumber have been large. An advance, which had been anticipated, has been made in most descriptions The better descriptions of lumber as selects and high grade boards and strips are in especial request. Country dealers are sending in large orders. Long length piece stuff is much looked after. Lake freights generally have advanced.

WOOL.

Prices are firm at the late advance and higher values are anticipated. The Boston Commercial Bulletin says: Much of the consigned wool here is held above the market. Interior growers and shippers of wool are nearly all anticipating higher quotations this fall and winter. Our domestic clip of wool will probably be found insufficient, and foreign markets will consequently have to be drawn upon at higher prices, Unwashed wools have advanced to the level of washed fleeces. Of unwashed wool fair to good medium Ohio commands 44@46 cents. In washed fleeces we quote: Ohio XX, 43@45; do X, 42½@44; do No. 1, 40@48 .

OILS.

Lard oil continues firm and high, quoting 96@98c for extra; 85@92c. for X No. 1; 73@78c. for No. 1, and 68@69c. for No. 2 Elaine sells at 50c. and saponified at 60c. Linseed oil is very firm at 59@60c. for American and 65 for Calcutta. Palm oil is higher at 7@9c. Crude cotton seed oil is in light supply and firm at 38@43c. and refined summer yellow is firm at 50c. Castor oil is firm at 11@12 for lubricating. Paraffine is in fair demand at 16@23c.

LUMBER.

PLANK.

2 INCH—MIXED WIDTHS.

A1&2,$48, A3,$38, B.$30, C.$18@20, D.$14@15, E.$13.

1¼ AND 1½ INCH.

A1&2,$46, A3,$38, B.$30, C.$18@20. D$14@15. E$13.

BOARDS.

1 INCH MIXED WIDTHS.

A1&2,$42, A3,$34, B.$27, C.$18@ 0. D.$14@15, E.$13.

STOCK BOARDS.

12 INCHES WIDE.

A 1&2, $43, A3, $35, B. $28, C. $18@20, D. $15. E. $13.

STRIPS.

6 INCH.

A 1&2, $42, A3 $34, B. $32, C. $22, D. $17, E. $13.

WORKED LUMBER

Flooring.

A3, $42, B. $38, C. $24, D. $16.

Norway Flooring.

A3, $28; B $22; C $18.

Matched Drop Siding, 6 in.

A3, $42, B, $38, C, $24; D, $18.

Beaded Ceiling $2 higher than flooring

One half inch Bevel Siding.

A 1&2. $24, A3 $20, B $18

Ash Flooring, A1&2 $40.

BILL STUFF.

Small, 16 feet and under, $15.

20 feet and over, $4 less than length; 18 feet, $15.

SHINGLES, LATH AND MILL WORK

Shingles XXX 18 inches,	$3.80@4
Shingles Clear Butts	2.75@3
Lath	2 75
Surfacing one side $1.50; 2 sides	$2.00
Making, Flooring and Drop Sidings,	2.50

HARDWOODS.

OAK.—1st and 2d clear, 1 to 4 inch	$35 00
3d	30 00
1st common	25.00
2d common	28 00
BLACK WALNUT—Clear counter tops, 20-inch and up	150 00
1st and 2d inch	75 00
1st and 2d plank	80 00
Common	55 00
Select, ¾x10 inch and over	68 00
ASH—1 to 2 inch, $35, over 2 inch	38 00
Wagon stock	40 00
HICKORY wagon stock 1 to 4 inch	50 00
MAPLE—Clear, 1 to 4 inch	35 00
BUTTERNUT—1st and 2d clear, 1-inch	55 00
CHERRY—1-t and 2d clear, 1-inch	60 00
WHITEWOOD—Clear selected, w'd t to 4 in	40 0
1st and 2d clear, 1 to 4 inch	35 00
Selected	30 00

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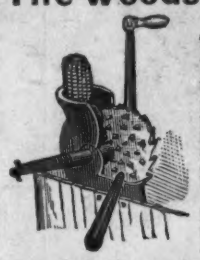
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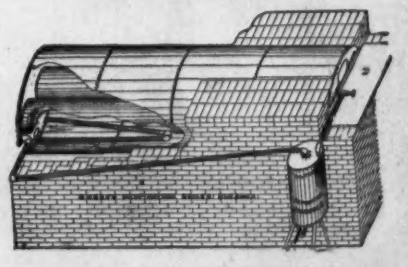
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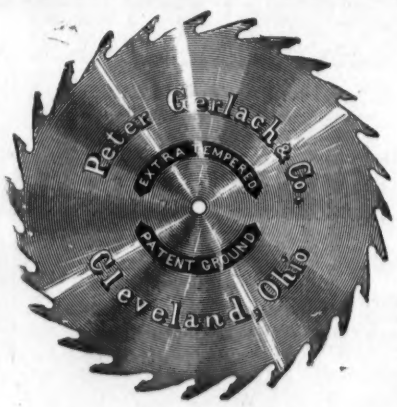

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